



User Manual

UIM24302A/B
Voltage Control
Miniature Integrated Stepper Motor Controller



UIM24302A/B

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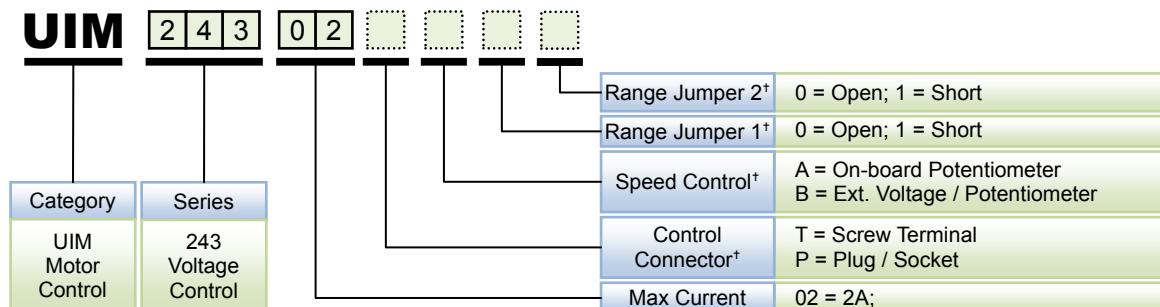
[Trade Mark/ Layout-design/Patent]

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[UIM24302 Ordering Information]

In order to serve you quicker and better, please provide the product number in following format.

UIM24302 PART NUMBERING SYSTEM

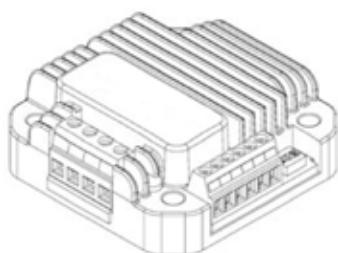


Note: [†] If not selected, the code box(es) can be deleted. Default options are:

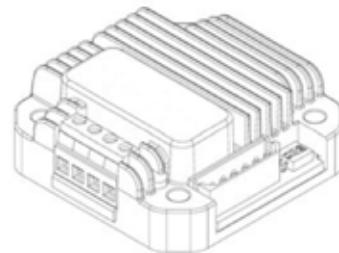
T (screw terminal), A (on-board potentiometer), 1 (J1 short), 1 (J2 short)

Examples: UIM24302; UIM24302PA00; UIM24302TB;

Examples of Control Connector options:



Screw Terminal



Rectangular Plug / Socket

UIM24302 Miniature Integrated Stepper Motor Controller

UIM24302A/B

Voltage Control

Miniature Integrated Stepper Motor Controller

Features

Miniature Integral Design

- Miniature size 42.3mm x 42.3mm x 16.5mm (L x W x H)
- Integrally designed to fit onto motors seamlessly, as well as work standalone
- Die-cast aluminum enclosure, improved heat dissipation and durability

Motor Driver Features

- 10 - 30VDC input voltage, Max 2A adjustable phase current
- 16th micro-stepping
- Dual full H-bridge with PWM constant current control

Control Features

- Embedded microcontroller
- Self pulse generation, automatic run on power-up
- Speed control through on-board trimmer 0.15 - 1900 RPM (UIM24302A)
- Speed control through external potentiometer 0.15 - 1900 RPM (UIM24302B)
- Speed control through 0 - 5V voltage input 0.15 - 1900 RPM (UIM24302B)
- 0.3 seconds acceleration period
- Switch control run/stop, direction, enable/shutdown
- Automatic current reduction / power saving

General Description

UIM24302 stepper motor controller is a microprocessor embedded, voltage control, miniature stepper motor controller.

With the UIM24302, the motor speed can be controlled by an analog voltage in three optional ways: 1) the on-board trimmer, 2) an external potentiometer or, 3) an external voltage. Run/stop, direction, high/low speed range and, enable/disable can be controlled simply by shorting the corresponding terminal to the ground. UIM24302 controllers can run the motor without user control device.

The microprocessor of the UIM24302A/B is capable to ramp up the current speed to the desired speed within 0.3 seconds, even when the speed control voltage is changing. This feature makes the sudden increase of the desired speed become possible.

UIM24302 can provide 0 - 2A adjustable phase current. Their mixed-decay current control reduces the back-EMF effect under high motor speed and improves the performance.

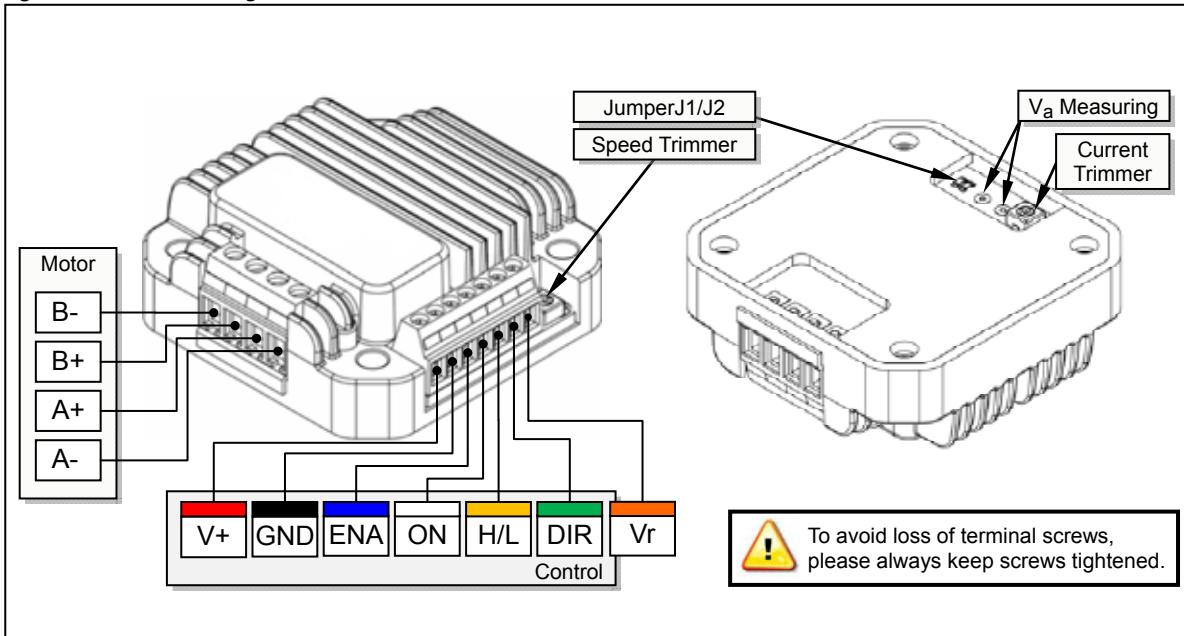
UIM24302 can be mounted onto NEMA 17 / 23 series stepper motor seamlessly through adapting flanges. The enclosure is made of die-cast aluminum which provides a rugged durable protection and improves the heat dissipation.

UIM24302A/B

Terminal Description

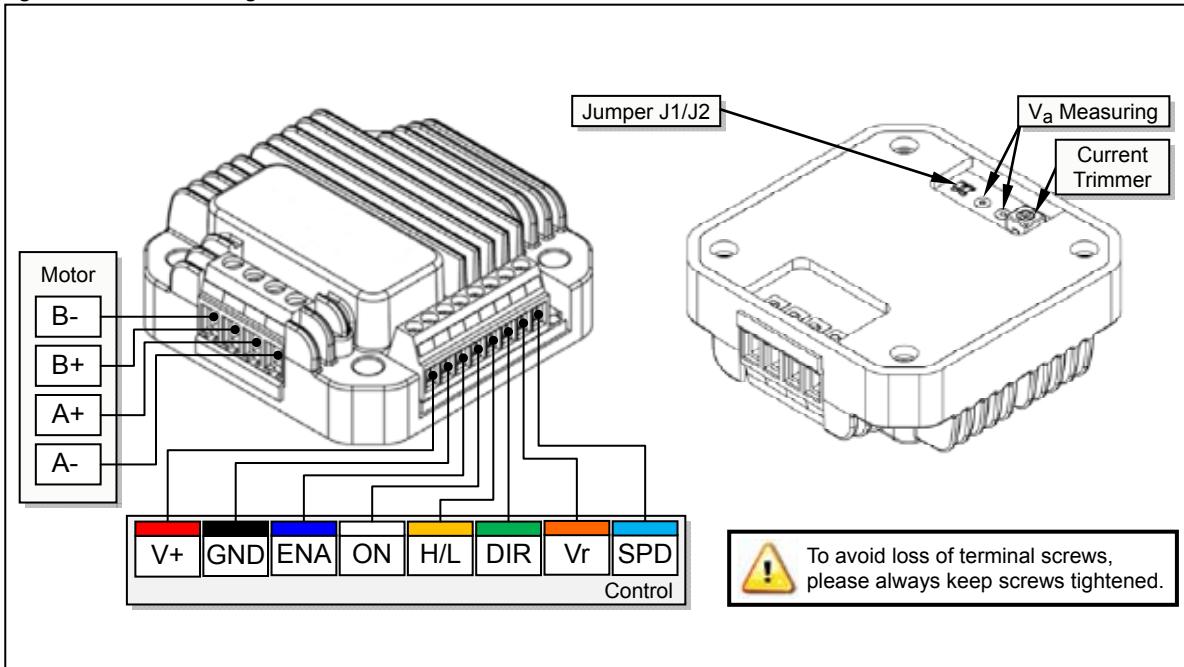
UIM24032A Wiring Terminal

Figure 0-1: UIM4032A wiring terminal



UIM24032B Wiring Terminal

Figure 0-2: UIM4032B wiring terminal



UIM24302 Miniature Integrated Stepper Motor Controller

Control Terminals

| Terminal No. | Designator | Description |
|----------------|------------|--|
| 1 | V+ | Supply voltage 10 – 30 VDC |
| 2 | GND | Supply voltage ground |
| 3 | ENA | Enable/Disable H-bridge, Internally pulled up |
| 4 | ON | Run/Stop, internally pulled up |
| 5 | H/L | High / Low Speed Range selection, internally pulled up |
| 6 | DIR | Direction input, internally pulled up |
| 7 | Vr | 5V Reference Voltage output (NEVER shorten Vr to GND) |
| 8 [†] | SPD | Speed Control Voltage input (0 – 5V) |

[†]NOTICE: Only UIM24302B provides this port.

Motor Terminals

| Terminal No. | Designator | Description |
|--------------|------------|--------------------------------------|
| 1/2 | A+ / A- | Connect to the stepper motor phase A |
| 3/4 | B- / B+ | Connect to the stepper motor phase B |



WARNING: Incorrect connection of phase winds will permanently damage the controller!

Resistance between leads of different phases is usually $> 100\text{ k}\Omega$. Resistance between leads of the same phase is usually $< 100\text{ }\Omega$.

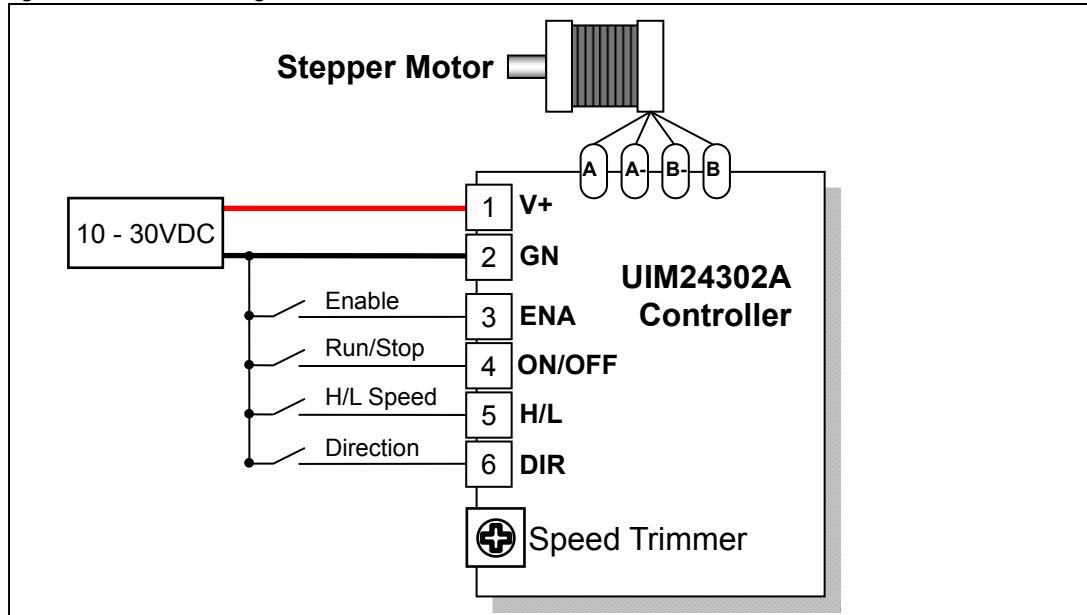
UIM24302A/B

Typical Application

UIM24302A controller is equipped with a million-cycle speed adjusting trimmer. UIM24302B allows the user to use an external potentiometer or external voltage to control the speed.

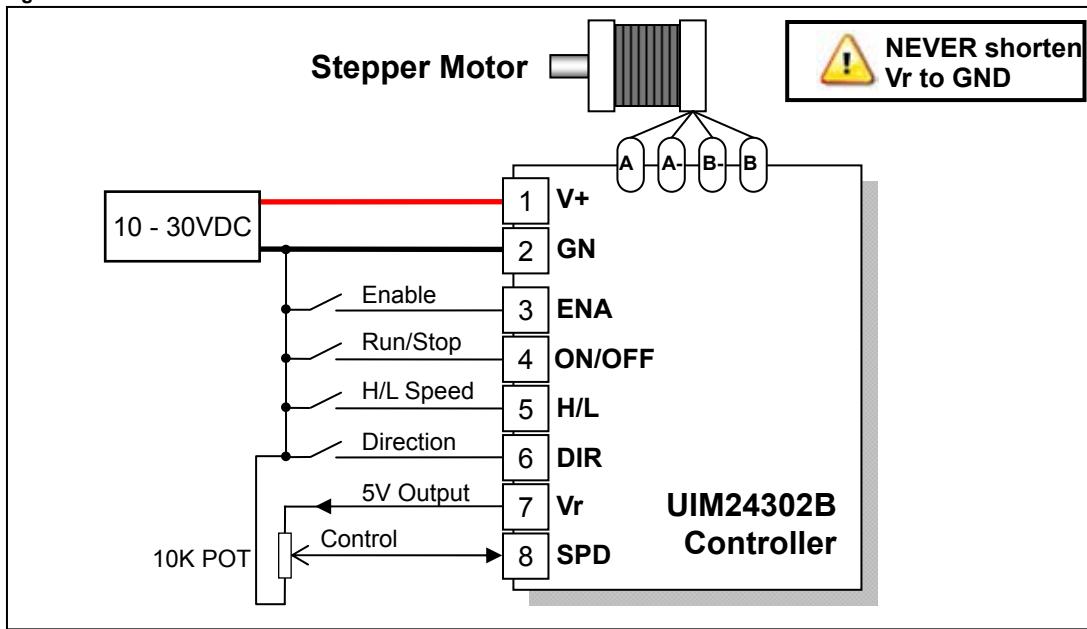
UIM24302A using Onboard Trimmer

Figure 1-1: UIM24302A using Onboard Trimmer



UIM24302B with External POT

Figure 1-2: UIM24302B with External POT

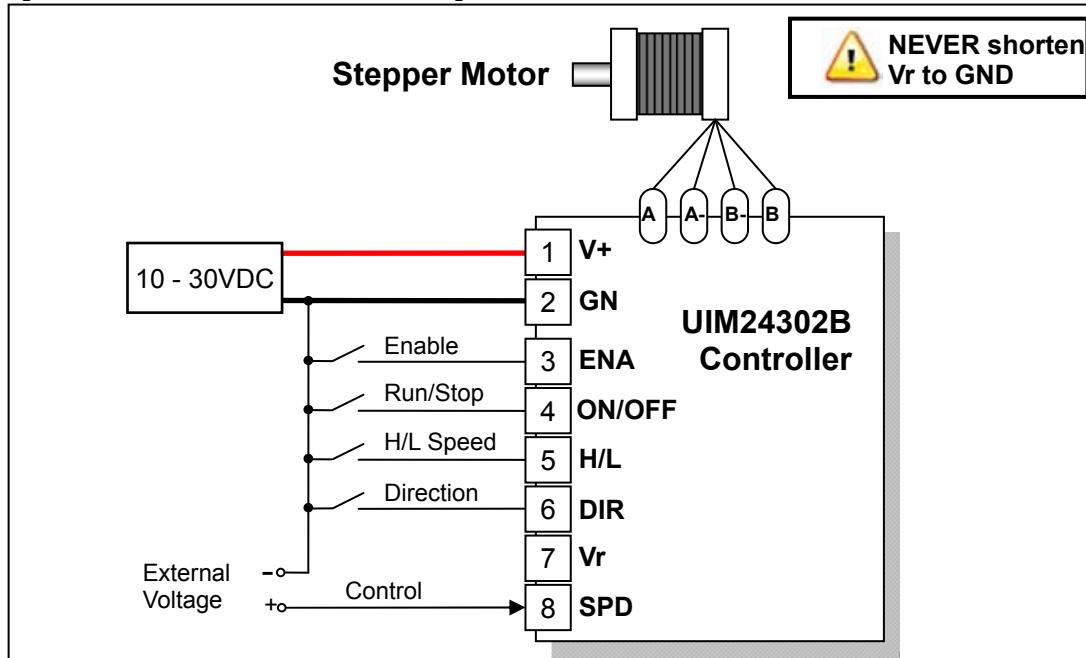


For users need to use external potentiometer (POT) to control the speed, UIM24302B provides a 5V reference voltage output, and a speed control voltage input port. The resistance of the POT should be between 5K and 10K ohms. Less than 5K will result in excessive power consumption, and larger than 10K will cause inaccurate measurement.

UIM24302 Miniature Integrated Stepper Motor Controller

UIM24302B with External Control Voltage

Figure 1-3: UIM24302B with External Control Voltage



For users want to use an external voltage to control the speed to facilitate the needs such as microprocessor D/A control, UIM24302B provides a speed control voltage input port. The external control voltage must share the common ground with the UIM24302B controller. In other words, the ground of the external control voltage must be linked to the terminal 2. In addition, the external control range must between -0.3V and 5.3V. Voltage outside the range will only produce smoke.

Characteristics

Absolute Maximum Ratings ^(†)

Supply Voltage..... 10V to 30V

Ambient temperature under bias..... -40°C to +85°C

Storage temperature..... -50°C to +150°C

†NOTICE: Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operation listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

Electrical Characteristics (Ambient Temperature 25°C)

| | |
|-----------------------|--|
| Supply Power Voltage | 10 ~ 30VDC |
| Motor Output Current | Max 2A per phase (Adjustable through on-board trimmer) |
| Driving Mode | PWM constant current |
| Stepping Resolution | 16 th fixed |
| Insulation Resistance | >100MΩ |
| Dielectric Strength | 0.5KV in one minute |
| Speed Range | 8 Hz – 102K Hz, 0.15 - 1912.5 RPM (1.8° Motor) |

Environment Requirements

| | |
|---------------------|--|
| Cooling | Free air |
| Working environment | Avoid dust, oil mist and corrosive gases |
| Working temperature | -40°C ~ 85°C |
| Humidity | <80%RH, no condensation, no frosting |
| Vibration | 3G Max |
| Storage temperature | -50°C ~ 150°C |

Size and Weight

| | |
|--------|--------------------------|
| Size | 42.3mm x 42.3mm x 16.5mm |
| Weight | 0.1 kg |

UIM24302 Miniature Integrated Stepper Motor Controller

Functional Description

Supply Voltage

UIM24302A/B controller accepts a wide range input voltage from 10 to 30VDC. In general, higher supply voltage improves motor performance under high speed situation, but also increases the power loss and temperature raise.

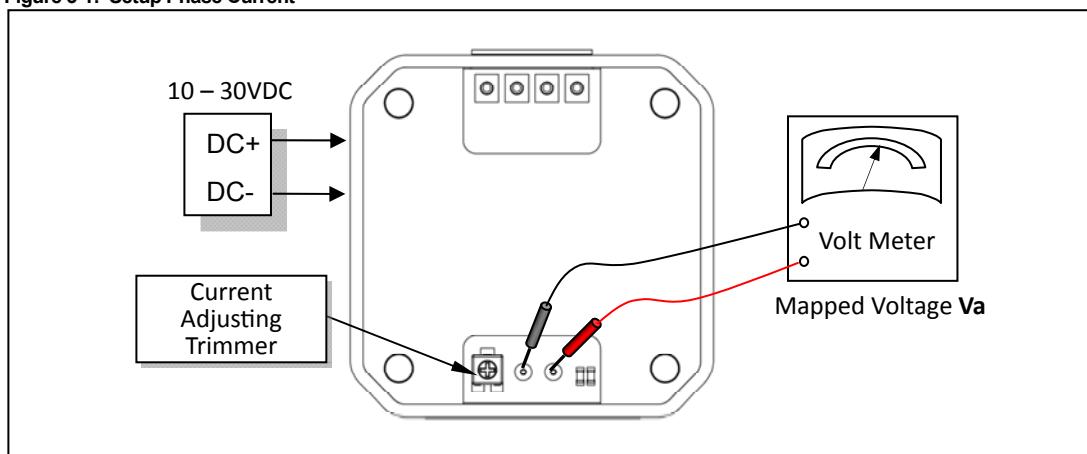
Output Phase Current

UIM24302 is capable of providing a maximum 2A phase output current. In specific application, the peak output current needs to be adjusted to meet the rated motor current. A trimmer (potentiometer) is provided to serve this purpose at the bottom of the controller, as shown in the figure 3-1. Measuring the mapped voltage (V_a) when tuning the trimmer provides a easy way to set the output current.

A mapped voltage “ V_a ” of 0 - 4V proportionally represents 0 ~ 2A.

Please note that, the controller needs to be powered before mapped voltage “ V_a ” can be measured. Reboot of the controller is required after the setup the phase current.

Figure 3-1: Setup Phase Current



Speed Control

UIM24302 onboard processor is able to produce 8 Hz – 102 KHz step driving pulses. Under 16th micro stepping, that pulse rate equal to 0.15 – 1900 RPM speed for a 1.8 degree stepper motor. UIM24302 provides three methods to adjust the speed:

Onboard trimmer

For UIM24302A, adjusting the onboard trimmer will give the desired motor speed.

External potentiometer

For users who need to use external potentiometer (POT) to control the speed, UIM24302B provides a 5V reference voltage output, and a speed control voltage input port. The resistance of the POT should be between 5K and 10K ohms. Less than 5K will result in excessive power consumption, and larger than 10K will cause inaccurate measurement.

External control voltage

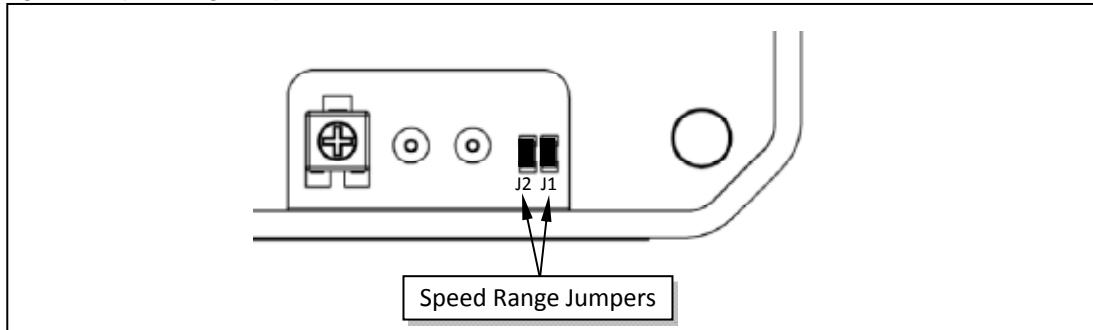
For users want to use an external voltage to control the speed to facilitate the needs such as microprocessor D/A control, UIM24302B provides a speed control voltage input port. The external control voltage must share the common ground with the UIM24302B controller. In other words, the ground of the external control voltage must be linked to the terminal 2. In addition, the external control range must between -0.3V and 5.3V. Voltage outside the range will only produce smoke.

Speed Range Selection

To preserve the accuracy of the measurement of the speed control voltage, the user should select the proper speed range. Since the voltage measurement accuracy is 8bit, (UIM24302 uses a 10bit A/D converter, and abandon the last 2 digits to suppress the noise), the speed adjusting is not continuous, but has an incremental of 1/255 of the max speed.

UIM24302A/B

Figure 3-1: Speed Range Jumper J1/J2



High Speed Range

When the desired speed is high, the high speed range should be selected, by leaving the terminal 5 open (i.e., not connected) or linking to 5V. In the high speed range, there are two jumpers at the bottom of the controller, which can further limit the range of the speed. The relationship between the two jumpers and the speed range is given in the following table:

| J1 | J2 | Pulse Frequency (Hz) | Speed for 1.8 stepper (RPM) | Note |
|-------|-------|----------------------|-----------------------------|-----------------|
| open | short | 100 - 102K | 1.875 – 1912.5 | |
| short | short | 100 - 102K | 1.875 – 1912.5 | Factory Default |
| open | short | 100 - 51K | 1.875 – 956.25 | |
| short | open | 100 – 25.5K | 1.875 – 478.13 | |

Low Speed Range

When the desired speed is low, the low speed range should be selected, by linking the terminal 5 to ground (i.e., terminal 2). In the low speed range, there are two jumpers at the bottom of the controller, which can further limit the range of the speed. The relationship between the two jumpers and the speed range is given in the following table:

| J1 | J2 | Pulse Frequency (Hz) | Speed for 1.8 stepper (RPM) | Note |
|-------|-------|----------------------|-----------------------------|-----------------|
| open | short | 8 – 8.16K | 0.15 – 153 | |
| short | short | 8 – 8.16K | 0.15 – 153 | Factory Default |
| open | short | 8 – 4.08K | 0.15 – 76.5 | |
| short | open | 8 – 1.04K | 0.15 – 38.25 | |

NOTICE: Please provide your speed range when ordering, if you want the jumpers to be set by the factory.

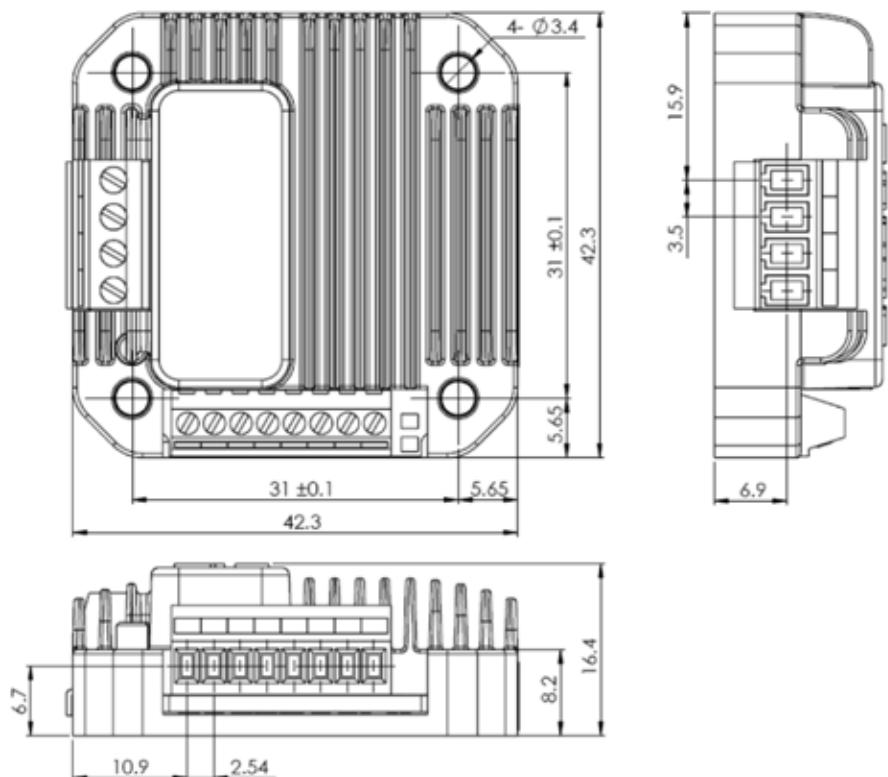
Acceleration / Deceleration

The microprocessor of the UIM24302A/B is capable to ramp up the current speed to the desired speed in 0.3 seconds, even when the speed control voltage is changing. This feature makes the sudden increase of the desired speed become possible. Actually for a proper made stepper motor, it is possible to jump to 1900 rpm in 0.3 seconds.

To guarantee the motor can stop as quicker as possible, the deceleration rate is set to infinity, which means the motor will output a desired speed (lower than current speed) immediately.

UIM24302 Miniature Integrated Stepper Motor Controller

APPENDIX A Dimensions

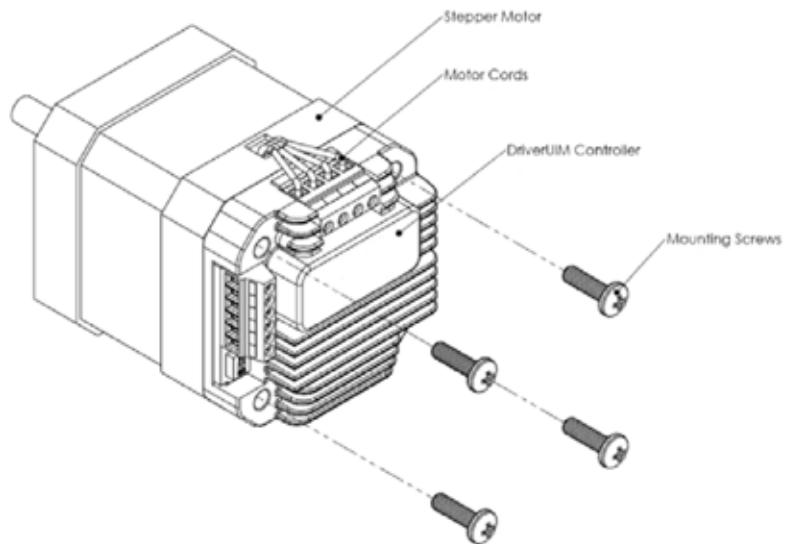


Units: mm

APPENDIX B Installation

NEMA 17 Stepper Installation (without adapting flange)

1. Screw mount UIM controller / driver onto the motor
2. Wire the motor leads.



NEMA 23 and Larger Stepper Installation (with adapting flange)

1. Screw mount the adapting flange onto the motor
2. Screw mount UIM controller / driver onto the adapting flange
3. Wire the motor leads.

